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ABSTRACT

As tides ebb and flood, quantities of diving, dying, and dead materials are moved from place to place. Many of these materials are stranded at the littoral fringe as the tide changes from flood to ebb. This area of stranded material, sometimes a belt as much as a meter wide, is appropriately known as the strand line. In these activities, students investigate a marine strand line before and after storms, make collections, analyze collections, and draw conclusions. Completion of the unit requires two field trips. (Author/RH)

Strand Line Observations for High School Students: An Exercise in the Marine Environment

by

Richard M. Schlenker

Abstract

Students actively investigate the marine strand line before and after storms, make collections, analyze the collections, draw conclusions, and write statements describing the storms' effect on the near sea areas. Completion of the unit requires two field trips.

Introduction

As the tides ebb and flood, quantities of living, dying and dead materials are moved from place to place. Many of these materials are stranded at the littoral fringe as the tide changes from flood to ebb. This area of stranded material, sometimes a belt as much as a meter wide is appropriately known as the strand line.

A good share of the materials found in this belt of stranded materials originate in the seawater adjacent to the area in which they are found or were epifaunal or infaunal organisms living in the adjacent littoral and sublittoral zones. Whatever their origin they do represent sea life close by.

There is, however, more about the strand line. Many of the intertidal marine organisms have adaptions which allow them to exist in this area. For example, the slipper limpet has a strong muscular foot which allows it to resist wave action, the blue mussel has a strong byssel thread which anchors it in place, the soft shell clam as well as the razor clam have strong muscular feet which allow them to burrow into the substrate, and many of the crabs have strong swimming and locomotor organs which allow them to change locations in response to environmental pressures. What does it mean when quantities of these organisms begin to show up in the stranded beach area?

Sudden appearances of large quantities of biological material in the strand belt suggests that there has been some recent environmental disturbance or perhaps a current and ongoing disturbance. However, the gradual appearance of material might simply be the result of casting out used structures and normal attrition.

Man made and man molded materials also appear in the strand area. Examples of these materials are, sections of crab pots and lobster traps, spots of oil, empty plastic containers, lobster buoys, hemp and nylon line, etc. Obviously, these items are indicators of recently past sea conditions, disasters at sea and the results of man's environmentally polluting activities.

To say that the strand line or area is a rich study site is an understatement. There is sufficient, though sometimes subtle, information in this area to occupy many marine science courses. The primary purpose of this unit is to introduce students and other interested persons to this area, its' signs, signals and indicators, so that its' natural occurring information may provide another link toward total understanding of the marine environment.

Objectives

1. to provide situations in which the student will be able to actively investigate the strand area.
2. to introduce the student to man-made and man-molded debris which collects in the strand area.
3. to introduce students to biological materials which collect in the strand area.
4. to provide discussion situations which culminate in synthesis of statements describing living conditions in areas adjacent to the study site.
5. to develop observation skills.

Goals

As a result of participation in this unit, the student will be able to;

1. independently investigate the sea/land interface.
2. construct hypotheses concerning forces acting upon inshore areas, normal attrition in inshore areas, some types of man-made pollution, trauma at sea, etc.
3. discuss the effects of storms upon the inshore biological communities.

Materials

1. Several hand lenses.
2. collecting tins; 1 lb. coffee cans are appropriate.
3. several sheets of thin white cardboard.
4. field notebooks, one per student
5. a collecting basket
6. a tide table

Procedures

1. This activity requires two field trips prior to its' completion. One trip should be taken after a relatively long period of calm weather. The second trip should be taken as soon as possible after a major storm. When choosing a field trip site, the instructor should hold these requirements in mind. The site should be close enough to the school to allow need for a minimum amount of post storm lead time before the trip is undertaken.
2. Conduct a group discussion concerning the strand area. The class should develop a series of questions to be answered during the trips. Some of these might be;
   a. How does the study area before a storm compare with the study area after a storm?
   b. What types of man-made objects are to be found in this area and what is their possible source?
   c. Are the majority of man-made objects subject to biodegragation or do they enjoy an extended life span?
   d. Are organic remains primarily floral or faunal?
   e. Are any, obviously juvenile representatives found?
   f. Can any obvious evidence of predation be found?
3. Discuss beach and seaside safety, correct clothing and foot wear are of paramount importance.
4. Plan to arrive at the study site about 2 hours after high tide.
5. Upon arrival at the study area give the group a few moments to look over and become familiar with the site.
6. Investigate man-made debris first. As a group, collect as many different examples as possible and store them in the collecting basket. This material as well as other material should be taken back to school.

7. Next, collect as many different representatives algal species as are possible. Relative quantities of this material should be noted in field notebooks.
8. Collect several cans of shells and other materials. The shells often congregate at common collecting points. When making a collection, take the entire sample from the same area.
9. Note and collect representatives of other organisms; juvenile crabs, molted crab and lobster shells.
10. Take field notes which generally describe the area. Note any obvious permanent geographical features. Take other notes which might have a bearing on sample analysis.
11. Return to schcol.
12. Following session;
    a. Divide the class into groups. Each group should analyze a portion of the data, for example, one group might analyze the shell collections.
    b. Each shell collection should be well spread on a piece of white cardboard. Some obvious things to look for, follow;
        1) Is there more than one species present?
        2) What is the dominant species?
        3) Is there any particulate manner present? A large quantity may be an indicator of periodic vigorous wave action.
        4) Is there any obvious evidence of predation? One, most certainly to be found, is a small hole in a shell. These holes are round, about a millimeter in diameter and tapered toward the center of the hole from the outside. This is evidence that some welk species, perhaps Thais lapillis is pursuring his carniverous appetite.
        5) How large are these shells? Are most small with only an occassional large shell or vice versa?

c. Similar procedures should be followed by the other examining groups.

d. Each group should tabulate its' data in some coherent form.

13. Session three; conduct a group discussion. The group should synthesize a statement which provides as much information about the intertidal and adjacent sea areas as is possible. Included in the statement should be an hypothesis concerning the origin of the human pollution.

14. During the post storm trip, follow the same collecting procedures.

15. In school sample analysis should be as above.

16. Conduct a group discussion in which the data from the two trips is compared and contrasted.

Evaluation

1. Each student writes a statement describing the environmental impact of the storm upon the area.

2. Discuss the origins of man-made materials found in the strand area, their points of origin, and possible modes of transportation prior to arriving at the study area.

3. Design an investigation of a rocky shore in which you hope to investigate parameters similiar to those investigated during your field trips.